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The Effect of Submergence on Rice Seed Quality

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Abstract

Flooding is a major constraint to rice production in many areas. The unpredictable nature of flooding events, including varying depth, duration and timing make it difficult to manage. Changes in the global climate are predicted to alter weather patterns resulting in more frequent heavy storms and sea level rise, which will exacerbate the problem. Therefore, improving our understanding of the impact this stress has on rice production and the development of methods for managing this stress are needed. This study set out to examine submergence effects at different ripening stages on subsequent rice seed quality. We grew *japonica* rice cv. Gleva and two *indica* cvs. IR64 and submergence-tolerant IR64Sub1, under controlled environment conditions. Plants were then subjected to full-submergence for 4d at 10, 30 and 40 days after anthesis (DAA), or not (no submergence control). Seeds were harvested 47 DAA and examined for agronomic traits. For all conditions and cultivars, submergence led to a decrease in seed weight, size and a substantial loss in yield. There was a 16-44% yield reduction, particularly when simulated flooding occurred at the initial stage of seed development (10 DAA). Pre-harvest sprouting (PHS) was detected from seeds submerged at 30 DAA or later in cv. Gleva. When submerged at 40 DAA, more than 65% of seeds of Gleva sprouted, compared to less than 1% from either IR64 or IR64Sub1. The impact of submergence was greatest on yield, seed weight and size, whereas the extent of any detrimental effect on subsequent seed storage longevity of non-sprouted seed storability was small. In conclusion, our data showed that submergence negatively affected rice seed production, but was dependent on genotype.

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Keywords: rice; flooding; submergence; seed quality; longevity

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